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APPENDIX A

TRENDS IN TOBACCO USE IN THE UNITED STATES

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Introduction

The focus of this Appendix is on trends in the prevalence and demographic correlates of tobacco use. Findings from selected data sources (US DHHS 1986b; USDA 1986; US FTC 1981, 1986; US DHHS 1988) will be reported as well as findings from analyses of trend data found in these sources.

Prevalence of Smoking in the United States

Several surveys using different methodologies have reported the prevalence of current cigarette smoking in the United States. The reported prevalence of smoking between 1944 and 1986 is shown in Table 1. However, different methodologies can lead to variations in the estimation of prevalence. The same general survey methodology has been used throughout the National Health Interview Surveys (NHIS 1965 to 1985). These surveys have indicated a steady decline in smoking prevalence beginning in the late 1960s to 30.4 percent of adults 20 years of age and older in 1985. These data parallel the per capita consumption of cigarettes in the United States, which has declined each year since 1973 (Table 2). Based on population estimates and the NHIS, the total number of adult smokers (aged 20 years and older) in the United States declined from approximately 52,400,000 in 1976 to approximately 51,100,000 in 1985. The total number of former smokers increased from approximately 29,500,000 to 40,900,000 within this time period.

Trends in Cigarettes Consumed

In the United States, cigarettes are taxed at the wholesale level, in advance of retail sales. Tax data may not reflect retail sales in any particular year insofar as different inventory levels are held over time. However, the number of cigarettes taxed is a standard index used to estimate the number of cigarettes consumed over time. Total cigarette consumption as estimated by this index in the United States increased steadily from 1920 until 1981 when an estimated total of 640 billion cigarettes were smoked (Table 2). Since 1981, there has been a steady decline in consumption and the number of cigarettes smoked in 1987 is estimated at 574 billion.

These data are frequently divided by the population of adults 18 years of age and older to give a per capita estimate of consumption. It should be noted that this per capita estimate could be biased if there is a trend over time for more people to start smoking regularly under 18 years of age.

Since 1973, there has been a decline of 23 percent in the number of cigarettes smoked on a per capita basis. Although there has been a

TABLE 1.—Percentage of current cigarette smokers among adults, by year and survey, United States, 1944–1986

Year	Survey	Age (≥ years)	Current cigarette smokers (percentage)		
			Men	Women	Total
1944	GP	18	48.0	36.0	41.0
1949	GP	18	54.0	33.0	44.0
1955	CPS	18	54.2	24.5	37.6
1964	NCSH	21	52.9	31.5	40.3
1965	NHIS	17	51.1	33.3	41.7
1966	CPS	17	50.0	32.3	40.6
	NCSH	21	51.9	33.7	42.2
1967	CPS	17	49.1	32.1	40.1
1968	CPS	17	47.0	31.2	38.6
1970	NHIS	17	43.5	31.1	36.9
	NCHS	21	42.3	30.5	36.2
1974	NHIS	17	42.7	31.9	37.0
1975	NCSH	21	39.3	28.9	33.8
1976	NHIS	20	41.9	32.0	36.7
1978	NHIS	17	37.5	29.6	33.2
1980	NHIS	20	38.3	29.4	33.6
1983	NHIS	20	35.7	29.4	32.4
1985	CPS	16	31.8	25.4	28.4
	NHIS	20	33.2	27.9	30.4
1986	OSH	17	29.5	23.8	26.5

NOTE: GP, Gallup Poll; CPS, Current Population Survey (Supplement); NCSH, National Clearinghouse for Smoking and Health (Adult Use of Tobacco Survey); NHIS, National Health Interview Survey; OSH, Office on Smoking and Health (Adult Use of Tobacco Survey). NHIS data are not age adjusted.

SOURCE: U.S. DHHS (1987c).

decline in every one of these 15 years, the rate of decline has varied from 0.2 to 7.2 percent with a mean of 1.9 percent per year (Table 2).

Trends in the Tar and Nicotine Content of Cigarettes Consumed

Data on the market share of cigarettes of different smoking machine determined tar and nicotine yield have been published by the Federal Trade Commission (FTC) from information supplied to the agency by cigarette companies. The FTC is no longer generating these data. Trends in the sales-weighted average yield of tar and nicotine for cigarettes sold are shown in Figure 1. The sales-weighted average represents the tar and nicotine content found in specific brands averaged by the quantity of sales for that specific brand.

Throughout the 1970s there was a steady decline in the sales-weighted average. This decline may have occurred because of consumer beliefs that lower-yield brands are less hazardous. The impression that low-yield brands may be less hazardous may have resulted in part from cigarette advertising implying that low-yield brands are less hazardous or safe (Davis 1987).

TABLE 2.—Total cigarette consumption and consumption per capita 18 years of age and older, 1973 to 1987, United States

Year	Total consumption (billions)	Per capita consumption (≥ 18 years old)	Per capita consumption change from previous year (percentage)
1973	589.7	4.148	
1974	599.0	4.141	-0.2
1975	607.2	4.123	-0.4
1976	613.5	4.092	-0.8
1977	617.0	4.051	-1.0
1978	616.0	3.967	-2.1
1979	621.5	3.861	-2.7
1980	631.5	3.844	-0.4
1981	640.0	3.836	-0.2
1982	634.0	3.739	-2.6
1983	600.0	3.488	-7.2
1984	600.4	3.446	-1.2
1985	594.0	3.370	-2.3
1986	583.8	3.274	-2.9
1987 (est.)	574.0	3.196	-2.4

SOURCE: USDA (1986).

From 1982 to 1985, the declining sales-weighted tar and nicotine yield leveled off. This change may be related to one or a combination of the following factors: (1) a persistent brand loyalty of some smokers to moderate- or high-yield brands because of brand image; (2) a diminishing perception that low-yield brands are less hazardous; (3) some smokers are now smoking cigarettes of such low tar and nicotine yields that further reductions in those yields may be unacceptable; i.e., the "lower boundary" of comfortable cigarette use has been reached (Kozlowski 1987; Chapter IV). The 1981 Surgeon General's Report (US DHHS 1981) cautioned that the health benefits of switching to low-yield brands are minimal compared with giving up cigarettes entirely.

Surveys of Self-Reported Cigarette Smoking in Adults

General Considerations

The validity of self-reported smoking status from community surveys affects the usefulness of these data in reporting historical trends. Respondents' sensitivity to social stigma associated with

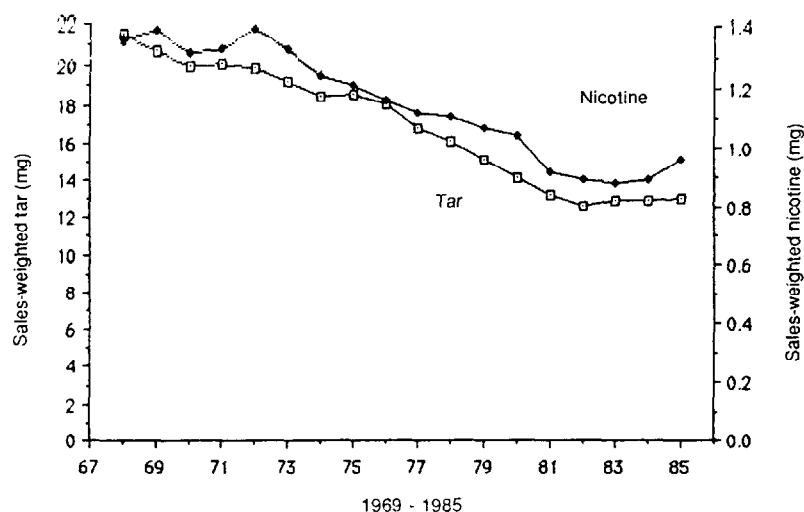


FIGURE 1.—Sales-weighted averages of tar and nicotine per cigarette, 1968–1985 (1985 data preliminary)

SOURCE: U.S. Federal Trade Commission (February 1988).

smoking is cited as a major reason why persons might underreport their smoking status (Warner 1978; Kozlowski 1986). Whereas biochemical assessment is significantly more reliable than self-reports in assessing level of nicotine intake (see Chapters II and IV), self-reported data appear valid for estimating prevalence of smoking in the population. For example, studies of patients in several settings (Petitti, Friedman, Kahn 1981; Pojer et al. 1984), as well as two large community studies (Fortmann et al. 1984; Pierce, Dwyer et al. 1987), have shown that measurements of smoking by self-report and biochemical markers give approximately the same estimates of prevalence. It is possible that the accuracy of self-reported data will vary depending on whether the data collection method is face-to-face or by telephone interview. However, biochemical validation data do not exist to allow quantification of such a difference. In addition, serious concerns have been expressed about the validity of data (Thornberry 1987) reported by one person on behalf of another (proxy response).

National Health Interview Surveys

The National Health Interview Survey (NHIS), which is conducted regularly by the National Center for Health Statistics, uses a

sampling frame developed by the U.S. Bureau of the Census and is based on a multistaged random probability sampling design. Information on behavioral health risk factors is collected in face-to-face interviews. Basic smoking information has been collected for several years, including 1965, 1976, 1978, 1979, 1980, 1983, and 1985 (data for 1965 are based on both self-report and proxy reporting; all of the more recent surveys were based on self-reports). The 1987 survey results were not available for this Report. Beginning in 1985, an adequate sample of blacks was ensured by the survey design (using the technique of oversampling). The NHIS generally has a response rate of 96 percent (Thornberry 1987). However, the smoking information is collected only by self-report in a supplement. This extra step in data collection procedures leads to a decrease in the response rate to approximately 90 percent.

Demographic Trends in Smoking Prevalence in Adults

Between 1965 and 1985, smoking prevalence decreased in all age, sex, and race categories with the exception of women aged 65 years and older (Table 3). This exception can be explained as a birth cohort effect (Warner and Murt 1982).

Both black and white males have decreased their smoking by an average of a percentage point per year over this 20-year period. However, in 1985, 41 percent of black males smoked, compared with 32 percent of white males. For all races, the largest decrease in smoking occurred in younger males; the 20- to 24-year-old age group decreased an average of 1.4 percentage points per year. The marked gradient in the degree of change per year across age groups suggests that a birth cohort effect may have occurred, with many more young males never having become regular smokers.

Proportionately fewer women smoke than men within every age group and race category except for persons 20 to 40 years old in 1985 (31.0 percent for men, 32.1 percent for women). However, the yearly rate of decline in smoking prevalence across these categories is, on average, three times less than the male rate of decline. Moreover, the decline in female smoking appears mainly in the under-44-year age group. This may indicate that uptake of smoking among women in the more recent birth cohorts is beginning to decline. Of particular importance is the almost complete lack of change in smoking prevalence among black women from 1965 to 1985.

Smoking rates among Hispanics have been reported using NHIS data (Marcus and Crane 1985, 1987), but the small sample size of this subpopulation reduces the reliability of the estimates. According to the 1985 NHIS, the prevalence of smoking among Hispanic males and females aged 18 and older was 31.3 percent and 20.8 percent, respectively (Marcus and Crane 1987). Information on Hispanic smoking is also available from the Hispanic Health and Nutrition

TABLE 3.—Twenty-year trends in smoking prevalence (percentage) among adults 20 years of age and older, by sex, race, and age, United States

Sex, race, age	1965	1976	1980	1985	Difference 1965-1985
Men					
Total ^{1,2}	52.1	41.6	37.9	32.7	-19.4
Race ¹					
White	51.3	41.0	37.1	31.8	-19.5
Black	59.6	50.1	44.9	40.6	-19.0
Age ²					
20-24	59.2	45.9	39.7	31.0	-28.2
25-34	60.7	48.5	43.1	38.2	-22.5
35-44	58.2	47.6	42.6	37.6	-20.6
45-64	51.9	41.3	40.8	33.4	-18.5
≥ 65	28.5	23.0	17.9	19.6	-8.9
Women					
Total ^{1,2}	34.2	32.5	29.8	28.3	-5.9
Race ¹					
White	34.5	32.4	30.0	28.3	-6.2
Black	32.7	34.7	30.6	31.6	-1.1
Age ²					
20-24	41.9	34.2	32.7	32.1	-9.8
25-34	43.7	37.5	31.6	32.0	-11.7
35-44	43.7	38.2	34.9	31.5	-12.2
45-64	32.0	34.8	30.8	29.9	-2.1
≥ 65	9.6	12.8	16.8	13.5	+3.9

¹ Age-adjusted prevalence rates.

² Includes white, black, and other.

SOURCE: U.S. PHS (1987).

Examination Survey (HHANES), which was conducted by the National Center for Health Statistics between 1982 and 1984. This study surveyed 9,000 Mexican-Americans in the Southwest, 4,000 Puerto Ricans in the Northeast, and 1,500 Cuban-Americans in Miami. For males aged 20 to 74 the age-adjusted smoking rates were 43 percent for Mexican-Americans, 42 percent for Cuban-Americans, and 40 percent for Puerto Rican-Americans. Among females, the smoking prevalence was 24 percent for Mexican-Americans and Cuban-Americans and 30 percent for Puerto Rican-Americans (Haynes 1987). Estimates of smoking prevalence among other minority groups may be unreliable because of small sample sizes included in the NHIS. Trend data are not available because Hispanic status was not ascertained on earlier surveys.

TABLE 4.—Smoking prevalence (percentage) among adults 18 years of age and older, by sociodemographic subgroups, United States, 1985

Subgroup	Men	Women	Total
Education			
Less than high school	40.1	31.4	35.4
High school graduate	36.6	31.0	33.4
Some college	29.9	24.9	27.3
College graduate	22.6	17.1	20.1
Postgraduate	17.3	15.1	16.5
Occupation			
Employed	33.8	30.0	32.1
White-collar	26.4	28.0	27.5
Blue-collar	40.1	33.9	39.7
Service	40.3	35.4	37.2
Unemployed	44.3	28.0	36.1
Not in workforce/Unknown	28.6	25.3	26.4
Marital status			
Never married	30.0	26.3	28.3
Divorced/Separated	48.2	42.4	44.7
Married/Cohabiting	31.9	27.7	29.7
Widowed	29.3	20.1	21.6
Income			
< \$10,000	36.3	29.7	32.3
\$10,000–19,999	37.0	29.8	33.1
\$20,000–34,999	33.1	28.1	30.7
≥ \$35,000	27.0	25.1	26.1

SOURCE: National Center for Health Statistics, National Health Interview Survey 1985.

Other Social Correlates of Smoking

The prevalence of smoking varies across sociodemographic categories. A detailed analysis of the sociodemographic correlates of smoking status in the 1985 NHIS survey is presented below.

Current smoking prevalence by sex, occupation, marital status, employment, education, and income groups for 1985 is shown in Table 4. Current smoking prevalence was inversely related to educational status. Persons who were employed were less likely to be current smokers than unemployed persons. Persons employed in white-collar jobs were less likely to be smokers than persons employed in blue-collar or service jobs. Persons with higher income and persons who were single, married, or widowed had a lower prevalence of smoking than persons with lower income or who were divorced or separated.

Because blacks were oversampled in the 1985 NHIS and subsequent sample designs, it is possible to make detailed comparisons

TABLE 5.—Percentage of current smokers in 1985, by age, race, and sex

Sex, age	White	Black
Men		
18-24	29.1	26.6
25-34	37.1	45.2
35-44	36.3	44.9
45-54	33.4	47.4
55-64	30.1	44.6
65-74	21.2	31.0
≥ 75	13.9	21.4
Women		
18-24	33.0	24.2
25-34	32.6	35.7
35-44	31.4	40.2
45-54	32.9	37.0
55-64	27.4	28.9
65-74	17.8	18.6
≥ 75	7.1	8.0

SOURCE: National Center for Health Statistics, National Health Interview Survey 1985.

between blacks and whites in smoking prevalence. Table 5 shows that across all age categories, except among those aged 18 to 24 years, blacks have higher smoking prevalence than whites. The lower smoking prevalence among blacks in this age group may reflect an older age of initiation among blacks.

In a multivariate analysis of NHIS data, controlling for sex, age, employment, poverty status, education, and marital status, blacks were no more likely to be ever smokers than whites (Novotny et al., in press). In this study, blacks were less likely than whites to quit smoking. Blacks also were less likely than whites to be heavier smokers (≥ 15 cigarettes per day).

Other Surveys Reporting Adult Prevalence of Smoking

The 1986 Adult Use of Tobacco Survey showed slightly lower rates of smoking than that expected from the trends observed in the National Health Interview Surveys (NHIS). These data, based on a telephone interview of 13,031 adults aged 17 and older, were weighted to reflect the U.S. population according to age, sex, education level, and region. An estimated 29.5 percent of males (95 percent confidence interval, 28.4 to 30.6) and 23.8 percent of females (95 percent confidence interval, 22.7 to 24.9) smoked cigarettes regularly. Differences from the NHIS may reflect differences in age of respondents (NCHS—age 18 and above, Adult Use Survey—age 17 and above), methodology (Waksberg 1978), or response rates (NCHS approximately 90 percent, Adult Use Survey approximately 74

percent). The exclusion of households lacking telephones appears to account for an underestimate of approximately 1 percentage point in telephone surveys; persons living in households without telephones have a higher smoking prevalence than those in households with telephones (US DHHS 1987c).

In 1985, a supplement to the Current Population Survey contained smoking information collected by household interviews. These data are particularly relevant because of the large sample population. However, 45 percent of responses were by proxy. Of the 114,342 persons surveyed, the overall smoking prevalence for persons 16 years of age and older was 31.8 percent for males and 25.4 percent for females (Table 1). A detailed analysis of this data set is available from the Office on Smoking and Health (Marcus and Crane 1987).

Since 1981, the Centers for Disease Control has coordinated the collection of State-specific data on several behavioral risk factors in the Behavioral Risk Factor Surveillance System (BRFSS). In 1986, 25 States and the District of Columbia participated in this telephone interview system (Table 6). Median State smoking prevalence among adults 18 years of age and older varied between 18 percent and 35 percent (US DHHS 1987c), with marked geographical distribution patterns. States east of the Mississippi appeared to have the highest smoking prevalences (US DHHS 1987d). These States also had the highest adult per capita consumption of cigarettes (Tobacco Institute 1986), as measured by sales of cigarettes taxed in each State.

Trends in Adolescent Smoking

The National Institute on Drug Abuse (NIDA) conducted household surveys on drug use in 1979, 1982, and 1985. Data were obtained from a stratified random sample of 8,000 U.S. households; approximately 2,000 interviews were conducted with respondents in the 12- to 17-year-old age group. Questions included whether any cigarettes were smoked within 30 days as well as within the previous year. These surveys indicated that approximately 26 percent of the teenage population surveyed smoked at least one cigarette at some time during 1985 (Table 7). In 1985, 15.6 percent of this population had smoked within the previous month. However, these overall mean values probably underestimate the level of experimentation and uptake of smoking during these ages due to response bias or underreporting. Comparisons with 1979 are not appropriate, because in that year, there was a markedly different definition of smoking compared with later years ("at least 100 cigarettes in lifetime" compared with "any smoking in last 30 days").

The "Monitoring of the Future" project, sponsored by NIDA, is conducted by the Institute for Social Research at the University of Michigan. It consists of a yearly survey of a representative sample of

TABLE 6.—Current smoking prevalence (percentage) in 25 States and the District of Columbia, 1986

State	Sample size	Current smokers			95 percent confidence interval
		Percentage			
		Men	Women	Total	
Alabama	559	30.3	20.0	24.8	±4.1
Arizona	1,178	24.4	24.7	24.5	±2.8
California	1,579	25.4	23.9	24.6	±2.4
District of Columbia	1,145	32.1	22.5	26.7	±3.1
Florida	1,162	30.9	27.8	29.3	±2.8
Georgia	1,140	29.3	24.8	26.7	±2.9
Hawaii	1,551	27.8	20.3	24.1	±2.9
Idaho	1,185	30.9	16.2	23.4	±2.6
Illinois	1,142	32.7	23.6	27.9	±2.8
Indiana	1,182	31.6	23.5	27.3	±3.0
Kentucky	1,216	37.2	32.6	34.8	±3.2
Massachusetts	1,105	27.1	27.5	27.3	±3.0
Minnesota	3,023	25.3	25.0	25.1	±1.7
Missouri	873	29.4	23.0	26.0	±3.3
Montana	1,176	23.5	22.8	23.0	±2.7
New Mexico	1,139	29.9	22.4	26.1	±2.8
New York	1,135	28.7	26.1	27.4	±3.0
North Carolina	1,622	30.7	22.5	26.4	±2.4
North Dakota	1,182	27.4	25.1	26.2	±2.9
Ohio	1,158	29.4	26.9	28.1	±2.8
Rhode Island	1,535	31.0	31.1	30.9	±2.5
South Carolina	1,793	28.6	24.4	26.3	±2.4
Tennessee	1,779	30.7	25.5	28.0	±2.4
Utah	1,188	20.8	15.1	17.8	±2.5
West Virginia	1,380	32.2	26.9	29.5	±2.8
Wisconsin	1,268	31.5	21.1	26.2	±2.6

SOURCE: US DHHS (1987a).

high school seniors. This approach does not include students who do not complete high school (estimated to be about 15 percent of the population by the U.S. Bureau of Census in 1978). Dropouts tend to have a higher smoking prevalence than in-school students (Kandel 1980; Pirie, Murray, Luepker 1988); however, Johnston and O'Malley (1985) estimate that the underestimate of the true population prevalence is no more than 5 percentage points. The latter researchers argue that the magnitude of this bias is unlikely to change between the yearly surveys; thus, the estimate of the rate of change should reflect the true rate of population change.

Smoking prevalence among female high school seniors was higher than among males in 1986 (Table 8), and there are marked

TABLE 7.—Prevalence (percentage) of cigarette use among youth 12 to 17 years of age, 1979, 1982, 1985 surveys, United States

Survey year	Any use in last year	Used in last 30 days
1979 ¹	13.3	12.1
1982	24.8	14.7
1985	26.0	15.6

¹The 1979 survey asked questions only of those who had smoked 100 cigarettes in their lifetime.
SOURCE: National Institute on Drug Abuse (1979, 1982, 1985).

TABLE 8.—Thirty-day prevalence of daily use of cigarettes by subgroups, high school class of 1986

Subgroups	N (approx.)	Percentage who used cigarettes daily in last 30 days	
		One or more	Half-pack or more
All seniors	15,200	18.7	11.4
Sex			
Men	7,100	16.9	10.7
Women	7,700	19.8	11.6
College plans			
None or under 4 years	5,100	28.2	19.2
Complete 4 years	9,100	12.8	6.4
Region			
Northeast	3,600	24.9	15.6
North-central	4,300	19.9	12.3
South	4,700	15.8	10.0
West	2,600	13.4	6.5

SOURCE: Johnston, O'Malley, Bachman (1987).

geographic differences in smoking prevalence among students. In addition, those students who plan to complete 4 years of college have a smoking rate less than half that of students without such plans.

The prevalence of daily use within the previous 30 days among high school seniors fell substantially from 1975 to 1986 for males and females (Figure 2). Since 1976, there has been an overall 35 percent reduction in smoking prevalence in this population. Most of this decline occurred between 1977 and 1981. For all students, the prevalence has fallen an average of 0.68 percentage points per year during this period (to 18.7 percent in 1986), similar to the rate of